mposium On "Spreading Decline" Of Citrus

Citrus Industry

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TOW, FLORIDA

NEW PRESIDENT

Florida State Horticultural Society

HOWARD A. THULBERRY

Long an active member of the Society, well known citrus grower and fertilizer company official.

Our Crop Reports

By S. Lloyd Frisbie

Estimating the annual citrus crop in advance of picking is certain to be a most difficult problem, but from the standpoint of its usefulness to the shippers and growers it appeals to us that some means must be adopted to make the reports issued from time to time during the season more accurate than is the case at present.

Certain newspaper headlines have already this season referred to the current crop estimate as the annual "Guessing Game." This attitude probably stems from the fact that in many cases the official government estimate has missed the factual records compiled at the end of the season by a considerable margin.

For instance last year the estimated orange crop was 79 million boxes and the actual yield totalled 91.3 million boxes, a variance of almost 13 million boxes, while in 1952 the October estimate was 81 million boxes while the actual yield totalled up to only 72.8 million boxes, a variance of more than 8 million boxes.

Frankly, we do not see how any group without a vastly more complicated method can arrive at any figure which may be presented with any assurance of a minimum of error.

In any event the grower, the canner and the shipper cannot fail to be perplexed as to just how to figure the worth of his oranges or how to most advantageously handle the marketing of the fruit when the records show a variance of several million boxes, one way or the other, from the official pre-season estimates.

Crop estimates are designed to result in orderly marketing, but any considerable discrepancy between reports and actual yield tends to make for disorder and confusion. The citrus industry requires definite information to lay plans for the utilization of each year's crop. An accurate forcast of the approximate size of the crop can be most helpful and by the same token an inaccurate report can be most disturbing.

In addition to forecasting the number of boxes of fruit it seems to us that it would be most helpful for the industry to have information concerning the sizes and internal quality of our crop.

The USDA collects information on the actual pickout in many groves and a tabulation of such information, as it becomes available would be helpful to all other growers. If this report were accompained by a general statement on the amount of the fruit, the size and internal quality of the crop, comparisons could be made with preceding years. Such information might be much better for the industry as a whole than the presentation of a total box figures of the crop estimate, which may be subject to a considerable margin of error.

We don't know just what the remedy is but it might be well for a committee from representative organizations within the industry to consult with Department of Agriculture representatives and ascertain just how the present figures are arrived at and to volunteer suggestions as to how greater accuracy might be achieved.


R. M. Pratt

Citrus Insect Control For November 1954


R. B. Johnson

W. L. THOMPSON,
R. M. PRATT
R. B. JOHNSON*
Florida Citrus Experiment Station, Lake Alfred


W. L. Thompson

Red scale activity continues to be unusually high for the fall months. In fact, the present average infestation is about 50 percent higher than it has been at the end of October in the last two years. Infestations are expected to be still higher in November. The peak of the present hatch will probably be reached some time in early November.

While the purple scale situation is not as acute as the red scale outlook, the average infestation is heavier than usual, and a further increase in activity is expected in November, with a peak being reached about the middle of the month. By the first of November the percent of scales in the young stages will be high enough for satisfactory control.

Purple mite activity has been generally low during the past three months, but the level has been high in the Ridge district and scattered groves in other areas have been heavily infested. Infestations have been exceptionally low in the Orlando and Gainesville districts. An increasing trend during November may be expected, but how extensive this may be is not clear at this time. Even a light infestation in this period can cause severe leaf drop.

Rust mite populations are at moderate levels and activity has been unchanged during the past month. Although there will be some increase during November, high populations are not expected. Some time during the month the infestation on leaves will become heavier than the infestation on fruit. Therefore, it is especially important in the fall and winter months to check leaves as well as fruit when groves are being examined for rust mite.

SPRAY PROGRAM

A scalicide will be needed in some groves during November or the winter months. November is the month that purple and chaff scales interfere with degreening. Fruit stays green at the site of each live purple or chaff scale and these green spots are a definite grade lowering factor. Control measures should be taken as early as possible, especially on tangerines, because it is not known how long before harvest scale must be killed to stop their affect on degreening.

Parathion is the preferred scalicide for late fall and winter sprays. Oil emulsion is not recommended because, if a freeze should occur, those trees sprayed in November or later in the season are more likely to be seriously damaged. Fall and winter oil sprays also may result in a light crop the following year and retard degreening of late season varieties the following spring.

Since the longest control of purple mite is always obtained where sprays are applied before high populations have built up, now is the time to start checking for this mite. In checking for purple mite, both green twigs and leaves of the summer and fall growth should be examined. Frequently during cool weather these mites are found most numerous on the green twigs and few on the leaves. Unhatched eggs as well as active mites should be noted because a high egg population may be a warning of a future high mite population.

DN Dry Mix is the preferred miticide for cool weather. Although aramite and ovex are effective and can be used, both are more expensive. Also, purple mites become resistant where ovex is used repeatedly. For these reasons it is believed advisable to use DN Dry Mix during cool weather and aramite and ovex during hot weather when DN Dry Mix cannot be used.

Rust mites are still with us. In checking for rust mites, both leaves and fruit should be examined. Sometimes these mites are present on leaves and absent from the fruit while at other times the opposite may be true. During cool weather tree tops are more likely to be infested than the lower sections of the trees. Rust mites must be kept at a low level to prevent russeting of fruit and leaf drop. Infestations on leaves and green twigs during cool weather have been known to cause defoliation.

Although a longer period of control can be expected during cool weather than during the summer months, a thorough application of sulfur sprays is essential, especially in the tops of trees, because sulfur has less fumigating effect in cool weather.

Scale Control: Use 1.0 to 1.7 pounds of parathion plus 5 to 8 pounds of wettable sulfur per 100 gallons of spray. The best control during cool weather is obtained when applications are made on warm, windless days. Since it is seldom necessary to spray large acreages at this time, it should be possible to wait for the best conditions.

Purple Mite Control: Use DN Dry Mix either as a spray or dust. Sprays are always more effective than dusts, but if dusts are preferred, use 1 1/2% DN Dry Mix-sulfur dust. For sprays use 2/3 pound of DN Dry Mix per 100 gallons. Whether sprays or dusts are used, thorough coverage and application before heavy populations build up are essential for maximum control. Poor results are almost always the result of too little material applied too late. For those who prefer a miticide other than DN Dry Mix, aramite at 2 pounds or ovex at 1.0 pounds per 100 gallons can be used. Any of these miticides may be included in parathion sprays, but if applied separately, include 5 to 8 pounds of wettable sulfur for rust mite control.

Rust Mite Control: One gallon of lime-sulfur plus 5 to 8 pounds of wettable sulfur per 100 gallons is the best spray for control of rust mites during cool weather. However, lime-sulfur may burn Hamlins, Jaffas, and tangerines, and should not be used on these varieties. If DN Dry Mix or aramite are to be used for purple mites and/or parathion for scales, omit the lime-sulfur and use 8 to 10 pounds of

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* Written October 26, 1954. Reports of surveys by Harold Holtsberg, Cocoa; J. W. Davis, Tavares; K. G. Townsend, Tampa; J. B. Weeks, Avon Park; and T. B. Hallam, Lake Alfred.

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Symposium On "Spreading Decline" Of Citrus[1] . . .

Introduction

In view of the increased interest in Spreading Decline which has developed in recent months and the increasing number of groves involved in it, it seems desirable at this point to present an adequate survey of the past history of the disease and the research work done on it, together with an outline of the types of work now in progress. Much of the early information was not published because it was negative in character and would have been interesting only to others working on the problem, and no other research agency was active in the field until very recently. As a consequence, work along many lines went unnoticed, though a large amount of work had to be carried out to determine the cause. In this symposium today, we propose to outline the general history of the disease and the research work up to this time and give it to you in a compact form.

A. F. CAMP
VICE DIRECTOR IN CHARGE
FLORIDA CITRUS EXPERIMENT
STATION, LAKE ALFRED

Spreading Decline was first noted sometime between 1926 and '28, in a grove near Winter Haven. At that time, no other infected groves were noted, but in 1935 and '36 the trouble started in a number of other groves in Polk County. At that time, some preliminary work was started and as the number of groves involved increased, more intensive work was started in 1939 with the work being directed toward determining what might be the cause. Usually a new trouble offers some telltale symptoms which tend to tie it to a certain category of troubles, which makes it possible to concentrate work along indirected lines. In the case of Spreading Decline, there were no symptoms of a revealing nature and parallel lines of work had to be followed to cover many possibilities such as fungus infections, soil toxins, virus infection and nematode infection, to name a few. This necessary dispersal of work among a small staff made progress slow and almost heartbreaking for the research men. There were relatively few cases in the early '40's but work was continued and expanded, using money from various sources since no money had been specifically appropriated for this trouble and relatively little interest had developed in it.

Starting in the late '40's, there appeared many new cases and work was accordingly intensified on a much larger scale to determine the cause. By this time, the nutritional angle had been eliminated and the possibility of virus infection also pretty well eliminated, but work on the fungus possibility and the nematodes was gradually being intensified until in 1953. Suit and DuCharme established the cause as the burrowing nematode and closed this phase of the work, making it possible to concentrate our research efforts in one channel. During this early period, a number of men whose names are not now associated with the work were active and Jamison, Voorhees, Fudge, Lawless and, to a minor degree, your speaker struggled with the problem.

In the ensuing discussion, Dr. DuCharme will cover an outline of the work up to the point where the burrowing nematode was established as the cause, including the various steps leading to its identification. Subsequent discussions will outline research findings of various types and

1. Presented before the Annual Meeting of the Florida State Horticultural Society at Miami Beach on October 22, 1954.

all of the work that is in progress at the present time. The work involved in this field has been enormous and great credit must go to those men who struggled on with the problem when its cause was obscure and the work yielded little in the way of publishable results. It is hoped that this outline will give you an idea of the scope of the work that has been carried on, the definite accomplishments which have been achieved and the work in progress.

The first presentation will be made by Dr. DuCharme.

Cause And Nature Of Spreading Decline Of Citrus

E. P. DuCHARME
FLORIDA CITRUS EXPERIMENT STATION, LAKE ALFRED

AT MEETING FLORIDA STATE HORTICULTURAL SOCIETY

As Dr. Camp has just told you, Spreading Decline is the most important trouble affecting citrus groves in Florida today and the primary cause of this disease has been established as the burrowing nematode, **Radopholus similis** (Cobb) Thorne. Spreading Decline was first noticed in Florida before 1930 but it was not until 1953 that the true cause of the disease was demonstrated. It is my purpose here to discuss for you the research that led to the discovery that the burrowing nemotode causes Spreading Decline; to describe the disease and show how it can be differentiated from other types of decline in Florida citrus groves; to tell you something about the nature of the disease and how it operates, and to discuss briefly other plant parasitic nematodes found in citrus groves.

A typical Spreading Decline area consists of a group of trees all of appearance. The trees are stunted, have undersize leaves, sparse foliage, reduced terminal growth, lowered yields and extensive deterioration of the feeder root system below a depth of about 20 inches. Such trees remain in a non-thrifty condition indefinitely but are not killed by this disease. Because of their deficient root system, diseased trees always wilt more readily during periods of drought than the adjoining healthly trees and frequently show temporary improvement under favorable moisture conditions. The Decline area is usually sharply separated from the healthy trees in the remainder of the grove and the area may occur at any point in a grove. What distinguishes it from other declines is the fact that the area spreads continuously and about equally in all directions regardless of elevation or direction of rows and cultivation.

This constant spread in all directions is one of the most characteristic features of the disease and led to its name, "Spreading Decline." For years the measurable annual rate of spread was the most reliable characteristic for diagnosing Spreading Decline in a grove. The rate of spread of the decline condition to new trees varies from grove to grove and from year to year in the same grove but the average rate of spread in 25 groves for 5 years was 1.6 trees per year on the margin as reported by Suit and Ford (13). From centers of infection, Spreading Decline moves out in all directions in a grove and crosses wide middles into other properties. So far, Spreading Decline has successfully crossed clay roads, asphalt roads with rights-of-way up to 100 feet wide and even railroad lines.

Bridging these distances between groves is probably accomplished by root contact or near contact. At the edges of groves, the roots of rough lemon stocks have been traced outward for as much as 50 and 60 feet. The characteristics of Spreading Decline as outlined above are sufficient to differentiate it from other types of decline such as foot rot, water damage and psorosis, which in some cases may produce trees of the same appearance but which do not spread in the same way.

There are certain measurable physiologic effects of this disease on affected trees. Ford (5 and 6) established that the respiration rate and catalase activity is lower in the roots of Decline trees than in those of healthy trees and higher in roots of the first and second trees from the margin than it is in either the Decline area or in the healthy trees more than three rows beyound the disease margin.

Once the condition known as Spreading Decline was recognized, efforts were immediately started to find the cause so that satisfactory control measures could be devised. The first lines of attack on the problem were naturally directed toward what appeared to be the most obvious factors that might have been responsible for the condition. As these early studies did not lead to a solution of the problem, the work was gradually expanded and intensified along many lines of research so that all probable factors were being investigated at the same time.

The general non-thrifty aspect of declining trees suggested that nutrition might be a primary causal factor. Consequently the nutrition of the affected trees in these areas was thoroughly investigated. Many experiments were designed to improve the fertilization practices in the areas of decline in an effort to correct the non-thrifty condition and to obtain evidence that would possibly demonstrate unsuspected minor element deficiencies. None of these was successful and it was concluded that the trouble was not primarily nutritional.

An intensive study was started to discover whether a fungus could be causing the disease since the pattern of spread seemed like that of a fungus. In all, more than 30,000 cultures of microorganisms (fungi, actinomycetes and bacterial) were isolated by Voorhees, Suit, Bliss, Sherbakoff, DuCharme and others from the rootlets of declining and healthy trees. More than 60 species of fungi and an undetermined number of actinomycetes and bacteria were isolated, but the same kinds of microorganisms were found associated with rootlets of both Decline and healthy trees in about the same numbers and no one kind of microorganism was found associated only with the areas of Spreading Decline. Hundreds of rough lemon seedling test plants were inoculated with isolates of the most commonly found microoganisms, mainly fungi. None of the fungi or other microorganisms tested caused typical symptoms of Spreading Decline under controlled conditions. Reports on the results of

some of these studies have been made by Suit et al. (10, 13, and 14) and Sherbakoff (8). Further investigations made since then confirm these observations. Almost all the fungus studies were made on feeder roots because there is virtually no destruction of secondary roots and none of the fungi isolated from feeder roots was ever isolated from the interior of roots 1/8 of an inch in diameter or larger.

Along with the fungus studies, experiments were made to determine whether or not a virus could be the cause of Spreading Decline. Four types of grafts were tried in this part of the investigation, between 1945 and 1951. More than 3000 buds from trees affected by Spreading Decline were budded into healthy test trees including seedlings, budded nursery trees and mature grove trees. During this same period, close to 900 pieces of roots from Decline trees were grafted into the root systems of healthy trees, both young and old. Numerous healthy trees were also patch grafted with immature leaf tissue from Decline trees. In 1951, a unique experiment was tried. Two rows of six trees each passing from a Spreading Decline margin into the adjacent healthy area were connected together by means of 20 root grafts between each pair of trees, with the ieda that if it was a virus, the rate of spread would be increased in these rows, but this was not the case. Spreading Decline was neither transmitted nor rate of spread increased by any of these procedures, yet some of the experiments have been in progress for nine years. All of the evidence obtained by these methods indicates that Spreading Decline is not a virus disease. Reports on some of these experiments were made by Suit (10) and Suit and Knorr (14).

Efforts were made by Dr. Wander (unpublished date) to demonstrate toxic substances possibly produced by soil organisms which did not directly attack the trees, these organism being present in the soil in areas affected by Spreading Decline but not present in healthy areas of the same grove. If a substance could be found that would be harmful to tree growth, it could be considered as a possible cause of Spreading Decline Accordingly, soils from Decline and healthy areas were leached with various solvents and in all cases the same kinds of substances were extracted and isolated from these areas. Depressing effects on citrus seedlings under controlled conditions were obtained with some of these substances, but the concentrations required to inhibit seedlings growth was far in excess of the amounts present in the soil. It was finally concluded that soil toxins were not the cause of Spreading Decline.

Studies on plant parasitic nematodes that could possibly be associated with Spreading Decline were started by Suit (10) in 1946. Since citrus nematodes, Tylenchulus semi-penetrans Cobb, had been found parasitizing citrus roots in Florida (1), the first phase of these studies was to determine whether or not the citrus nematode could be the cause of Spreading Decline. Study of this nematode in relation to Spreading Decline indicated that it was not the cause of the disease but the possibility that some other nematode could be involved was suggested by Suit and Knoor (14). Further investigation produced evidence that the total nematode population associated with the roots of trees in Decline areas was larger than that associated with the roots of healthy trees in the same grove.

The abnormal deterioration by fibrous roots of trees affected by Spreading Decline was initially reported by Suit (10). Since the primary cause of Spreading Decline could be ascribed neither to a fungus nor to the citrus nematode, more detailed studies were made on the origin of rootlet deterioration and the extent of rootlet destruction. Root observation boxes were constructed in the field and in the laboratory greenhouse in order to study the origin and development of brown lesions detected on rootlets of declining trees. A detailed study to measure the rootlets of declining trees. A detailed study to measure the reduction of feeder roots and to determine the zone of greatest rootlet loss, made by Ford (5), demonstrated that decline trees had about 40 percent less feeder roots than healthy trees and that most of the destruction occurred below 20 inches. At depths below 30 inches, Decline trees have 90 percent less feeder roots than healthy trees.

Following these observations, a critical study of total nematode population yielded positive evidence that more nematodes were associated with the rootlets of Decline trees than with roots of healthy trees at depths below 20 inches. An immediate and intensive search was made to find a nematode common to areas of Spreading Decline but not present in the healthy parts of the same grove. This investigation by Suit and DuCharme (12) led to the discovery in 1953 that the burrowing nematode, Radopholus similis (Cobb) Thorne, is the primary cause of Spreading Decline.

The proof that the burrowing nematode is the cause of Spreading Decline was established by the following observations and experiments:

1. The burrowing nematode was found to be the only parasitic nematode associated with the lesions in the feeder roots of Spreading Decline affected trees. A study of the feeder roots of affected trees showed that there were many brown lesions in the rootlets but that very few or no such lesions occurred on the rootlets of healthy trees. Since no fungus peculiar to Spreading Decline affected trees could be found associated with these lesions, the rootlets were dissected and a search was made for an endoparasitic nematode. These dissection studies revealed that in the discolored areas of the cortex there were small cavities connected to the exterior of the rootlet by tiny holes and splits in the epidermis. Burrowing nematodes were found in these cavities and tiny tunnels, within the discolored cortex tissues surrounding the cavities and in the healthy cortex in advance of the discolored areas. The xylem or woody tissue of the rootlet was not penetrated by this nematode. Rootlets from eleven groves with known centers of Spreading Decline were studied in this way and the burrowing nematode was found only within the feeder roots of trees from the Spreading Decline areas and in the feeder roots of the first apparently healthy trees, but never from rootlets of healthy trees outside the infested area. The burrowing nematode was also found in the soil about the rootlets of trees in areas of Spreading Decline but not in the soil about the roots of healthy trees away from the infested areas.

2. In citrus groves, the burrowing nematode occurred only in close proximity to trees affected by Spreading Decline. Following the root dissection study, a survey was made n fifty groves in order to see whether or not the presence of the burrowing nematode was correlated with known centers of Decline. Utilizing the sieve and Baermann techniques for extracting nematodes from soil and root samples, the burrowing nematode was found in all the Decline areas but not in healthy portions of the same groves, samples from the healthy trees being collected at least 200 feet beyound the last visibly affected trees. In addition, the burrowing nematode was not found in samples collected in 26 groves where there

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Extraction Of Citrus Juices[1]

In the production of citrus juice products the quality of the starting material is first in order of importance in determining the quality of the finished product. The quality of the end product can be, of course, no better than the quality of the fruit used. However, there are numerous operational steps involved in the production of citrus juices, single strength or frozen concentrates, with each having varying degrees of influence on the ultimate quality of the finished product. One of the most important, if not the most important, of the steps, is the extraction of the juice from the fruit. The newest and unquestionably the most unique method of extraction is the subject of the present discussion.

The Line Extractor

The FMC In-Line Extractor was so named because the series of extraction cups are situated in a straight line. This machine is built in two sizes. The five cup (or five head as it is usually called) has the capacity of extracting 200 fruit per minute. This unit is used for oranges, tangerines, lemons, limes, and small grapefruit. The three cup machine is used for the larger sizes of grapefruit and has a capacity of 120 fruit per minute. This unit is equipped with 6 inch diameter cups whereas, the five-head unit is equipped with either 3 or 4 inch cups as required.

The upper cups are mounted on a common cross-bar which by means of a cam-drive is moved in a fixed up and down path. The corresponding lower cups are held in a rigid position. All of these cups are so constructed as to consist of a plurality of fingers such that the individual upper and lower cups inter-mesh. A circular cutter tube is fastened in the bottom of each of the lower cup members, and this protrudes below into a strainer tube having 3/32 inch perforations. Mounted below the lower cups and enclosing the strainer tubes is a manifold which is common to all of the lower cups and strainer tubes of a single machine. An unperforated hollow tube (or orifice tube) closely fitted inside the strainer tube is caused to slide up and down inside the latter. The orfice tubes are fastened to a

R. D. GERWE (2)

cross-bar which is moved in a fixed up and down path by the same cam-drive which moves the upper cups.

The fruit is delivered by a conveyor belt to the rear side of the machine where there is a joined series of run-ways, one for each cup. A cam-driven lift functions as a positive means of placing fruit individually into the lower cups. The motion of the lift is synchronized with the movement of the upper cups and also the orifice tubes mounted on the lower bar.

When the fruit is placed in the lower cup the upper cup is moved down in a smooth stroke pressing the fruit against the cutter tube thus cutting a plug in the fruit. The inside of the inter-meshing cups is so contoured as to give virtual complete support to the outer surface of the fruit. As the upper cup continues its downward stroke the entire inner portion of the fruit is forced down into the strainer tube within the manifold. At the same time the orifice tube moves upward inside of the strainer tube thus causing the juice to be forced thru the perforated strainer tube into the manifold. The stroke is completed when the upper cup completely meets the cutter tube thus sealing off this tube and cutting a plug in the upper portion of the fruit. At this point of the stroke, the inner portion of the orange which has been forced into the strainer tube is completely pressed free of juice.

In the meantime the peel of the fruit is shredded and dropped into a screw conveyor trough which carries it to the by-product operation. The orifice tube operating inside of the strainer tube holds at any one time the pressed plugs or cores of four to five fruit, but then each time a fruit is extracted, a plug is discharged from the opening in the lower part of the tube. These plugs or cores consist of a plug of peel from each end of the fruit plus all of the "rag" or core of the fruit including the section walls and the seed. There are discharged into the by-product peel trough or seperately handled for ready separation of the seeds from which the oil may be removed for marketing separately.

This extractor is operated at a speed of 40 strokes per minute, and for the five head machine this amounts to 200 fruit per minute.

Cutter Tubes

Several modifications of design of the cutter tubes have been devised for quick-change to make it possible to put more or less peel oil into the juice as desired. Immediately inside of the ejector opening of the orifice tube previously described, is fastened a "restrictor-tube". The pressed fruit plugs must pass thru this to be ejected. These restrictors are available in several sizes based upon the diameter of their openings. Thus the pressure exerted on the pulp etc., within the strainer tube can be easily varied so that more or less pulpy suspended solids may be incorporated into the juice as desired. These features provide ample flexibility of adjustment.

A typical installation depending upon volume of production desired may consist of a single line of these extrectors fed by a common fruit conveyor belt, or may consist of two parallel lines with a conveyor belt between them.

In the case of a line for oranges a portion of the extractors are equipped with 3 inch cups, and part with 4 inch, thus requiring separation of the fruit into only two sizes. Since the cups are readily changeable, the proportion of machines to handle any of the two sizes can be changed

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(1) Presented at the Sixty-Seventh Meeting of The Florida State Horticultural Society, October 20-22, 1954, Miami Beach, Florida.

(2) Director of Research, Florida Division, Food Machinery and Chemical Corporation, Lakeland, Florida.

One Hundred Years Of Professional Entomology

Some Contributions The Profession Has Made To Florida Agriculture . . .

JOHN W. WILSON, ENTOMOLOGIST
CENTRAL FLORIDA
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AT MEETING FLORIDA STATE
HORTICULTURAL SOCIETY

The profession of economic entomology had its beginning as a profession in 1854 with the appointment of Dr. Asa Fitch as entomologist for the State of New York. A little later that same year Tounend Glover was appointed to the Federal Service as an "Expert for collecting statistics and other information on seed, fruit and insects in the United States". Early economic entomologists were looked upon by those who studied systematic entomology and scholars in other fields as unscientific dabblers. By a majority of the people they were caricatured as queer individuals who wore thick lensed glasses and were constantly chasing butterflies with a net. However, the contributions the entomologist has made to the wealth, health and happiness of mankind has now earned for him the respect of his fellow scientist and his fellow man.

Those of us who are actively engaged in the profession are being joined by workers in other fields in such meetings as this, in paying our respects to our predecessors as a fitting celebration of this one hundredth anniversary of economic entomology. It is fitting also, that the Florida State Horticultural Society should join in this celebration because many of the contributions to the agriculture of the State have been made with the support and encouragement of this Society.

When the preparation of this paper was begun it was immediately apparent that an adequate review of the contributions of entomology to Florida agriculture could not be covered in the time available. If an attempt should be made to include all of the contributions, time would permit little more than a listing of them and that would become monotonous. I have, therefore, chosen to discuss some of the developments which I consider to be the more outstanding contributions of the profession to the agriculture of our State.

In The Medical Field

The field of medical entomology is not usually associated with agriculture but the indirect benefits to agriculture of the work in this field are so great that the contributions of medical entomology must be given its share of credit for the advancement of agriculture in Florida. According to the officials of the State Board of Health it is more than fifty years since a case of yellow fever has been reported in Florida. The last evidence of the transmission of malaria occurred at Naples, Florida in 1948. The last big epidemic of dengue fever occurred during the early nineteen-thirties. Endemic typhus, a flea borne disease, is being reduced by the control of rats. The great reduction of sand fly and salt marsh mosquito population in recent years has added materially to the comfort and efficiency of those engaged in agricultural pursuits.

By the middle 1930's the control of the Texas fever tick had begun to show results in the form of an early beginning of quality beef production when a new threat to this phase of agriculture was introduced into the State. Losses due to the screw worm in Florida and other Gulf States in 1934 amounted to over 1,350,000 cases of infection and the death of more than 200,000 animals. Monetary losses are estimated to have been high as ten millions of dollars in Texas alone for the year 1935. In 1935 the Division of Insect Affecting Man and Animals of the U. S. D. A. established a laboratory for the study of the screw worm at Gainesville under the direction of W. G. Bruce. Work at this and other laboratories of the Division resulted in the development of the formula for smear 62, containing diphenylamine, benzol, turkey red oil and lamp black, which was released to the public in 1941. Substitutes for the turkey red oil which later became difficult to obtain, were found and incorporated in a formula known as smear 82. More recently formulations containing lindane have come into general use. Widespread observance of good cattle management practices combined with the use of insecticides have materially reduced the losses due to screw worm infestations.

The Citrus Field

The citrus industry is the largest and among the oldest of the agricultural enterprises of the State. Consequently it has experienced a number of major attacks by various insects, including the cottony cushion scale, the green citrus aphid, the Mediterranean fruit fly and the citrus black fly. At the time of their occurrance each of these insect threats appeared to be capable of permanently crippling the citrus industry. However, the early and energetic measures taken for the eradication of the Mediterranean fruit fly after its discovery on April 6, 1929 from one of the most spectacular chapters in the history of entomology. Under the direction of Dr. Wilmon Newell, Director of the State Plant Board, surveys were organized immediately to determine the extent of the infestation. By the end of April, Plant Board inspectors had found the fruit fly on 364 properties in 11 of the citrus producing counties. In the meantime the gravity of the situation had become apparent and $90,000 of State and Federal emergency funds had been made available. On May 2 Congress appropriated $4,250,000 and on June 7 the Florida Legislature appropriated $500,000 for the prosecution of the campaign. All of the available resources of the State, men and equipment were utilized. Great credit must be given Dr. Newell for his able leadership throughout this battle. The successful eradication of this pest from 1,002 properties in twenty counties over an area of between 15,00 and 16,000 square miles was accomplished in less than two years at a total cost of only $7,573,136.91. Important as this accomplishment was to the citrus industry, there were other important developments associated with this operation. The bait sprays were first extensively used in the control of this pest. The vapor-heat treatment method for treating large quantities

of fruit for shipment without spreading the infestation was developed and widely used. These methods have been adapted for use against other insects and to other plant products.

Aid to Vegetable Growers

In the field of vegetable production an entirely new crop, sweet corn, has been added within the past ten years to the list of important vegetable crops grown in Florida. The release of the hybrid variety, Ioana, in 1937 was the first step toward establishing sweet corn production as one of Florida's vegetable crops. It was found that this variety was capable of producing abundant yields of high quality corn under the climatic and soil conditions of Florida. The injection of an oil-pyrethrum mixture into the silk channel was an excellent control measure for the corn earworm. However, it had serious disadvantages which sharply limited the acreage of sweet corn that could be adequately protected against the ravages of this pest. The first work in the State with DDT as an agricultural insecticide was conducted by J. C. Russell at the Central Florida Experiment Station on the control of the corn earworm. Results of this investigation were reported in the Proceedings of this Society for the year 1944. Other entomologists of the Experiment Station have continued the study of the most effective use of DDT in earworm control. The results of their findings are being put to practical use by the sweet corn producers of the State. Prior to the growing season 1947-48 sweet corn was not widely enough grown to be included in the list of vegetable crops reported upon by the U. S. Bureau of Agricultural Economics. Reports on the acreage of sweet corn grown in Florida began with the 1947-48 season with 6,000 acres. The following season the acreage was doubled. Estimates for the 1949-50 season placed the acreage at 29,000. Acreages for the three subsequent seasons have been estimated to be 25,000 to 33,000 acres. Thus we have wituessed the increase of a crop having a valuation to the farmers of the State of more than 10 million dollars for the season of 1952-53.

Tobacco Pests Studied

During the spring of 1947 a very severe outbreak of the green peach aphid developed in Gadsden County on the shade tobacco of that area. The green peach aphid feeds on a very wide range of host plants. It had been observed in small numbers on tobacco prior to 1947, but never in sufficient numbers to require control measures. Because of the suddenness and intensity of the outbreak, entomologists of the Experiment Station staff were taken from their regular duties and sent to Quincy to initiate studies on the control of this pest. Two student entomologists were also sent to the area by the College of Agriculture. It was in this area during the spring and summer of 1947 that the first field experiments with parathion were conducted. The first commercial formulations of this insecticide were used in this area during the spring of 1948. As a result of this outbreak an entomologist was placed on the staff of the North Florida Experiment Station whose duties are the study of insects attacking field and forage crops of the area served by that Station.

The Use of DDT

The release in 1945 of DDT for general use marked the beginning of a revolution in insect control which is still in progress. We found that DDT was not the universal insecticide that it was first popularly reported to be. After DDT there followed in rapid sucession the release of a number of other chlorinated hydrocarbon insecticides, and the phosphatic insecticides. The new chemicals have drastically changed the economic entomologists method of approaching insect control problems. In the first place these newer materials have provided spectacular control of a number of insects which were previously very difficult to control. As examples: pickleworm and melon worm on cucurbits are readily controlled with lindane; stink bugs and the larger plant bugs are very effectively controlled with cholordane or parathion. Furthermore, the newer insecticides have advantages in the control of many insects that we previously considered satisfactorily controlled by the older insecticides. The more effective control of aphids on vegetable crops by parathion under Florida growing conditions, the reduction of tree injury and the reduction of coloring problems of early citrus by the use of parathion for scale control are only three illustrations of advangtages of the newer insecticides over those in use prior to 1942. The newer chemicals have the additional advantages, in many instances, of producing results much more rapidly than insecticides previously used.

New Insecticides

Another group of insecticides just now emerging from the laboratory stage of development are the systemics. This group of insecticides in-

clude those chemicals which are taken into the circulatory system of the plant and translocated to untreated parts of the plant in quantities that are toxic to insects. One of the advantages of the systemic insecticides is that since they are translocated to all parts of the plant the careful application of an even deposit on all parts of the plant is not required as is usually the case with other insecticides. In other words, it will be easier to reach insects in or on inaccessible parts of the plant with the systemic. Another advantage that the systemic poisons have is that once they are taken into the plant they are not subject to the washing effects of rainfall or decomposition due to light and temperature. Thus fewer applications are required. The systemic available at the present time are only effective against the soft bodied insects such as aphids and scales and the mites. However, the insecticide chemists are promising us systemics that will be effective against the larger chewing and sucking insects.

In recent years a great deal of work has been done on insecticides residues on edible crops. Information gathered from residue studies in other parts of the country cannot be relied upon as applicable to Florida grown crops. This is true because climatic conditions are one of the factors determining the amount of insecticides residues remaining on crops. The climate conditions prevailing during periods when most Florida crops are grown are usually completely different from those of other parts of the country. For this reason it is necessary to conduct residue studies on crops grown under Florida conditions. Consequently an entomologist and a biochemist were appointed to the Experiment Station staff on December 1, 1951. Other entomologists of the Station staff are cooperating with them in these studies. At the Citrus Experiment Station residue studies were initiated somewhat earlier. Already results of these investigations are being made available to the growers of the State. This information will be a valuable guide to the growers in their insect control operations. In addition it will help to guide the entomologists in their efforts to develope more effective insect control measures by stimulating further study on the placement and distribution of the insecticide on the plant.

We, as entomologists, can be justly proud of the body of information which has been accumulated in the past and the part our profession has had in contributing to the improved health, increased production, and higher living standards of the United States and of mankind in general. In our pride we must remember that all of these accomplishments were brought about by coordination and cooperation with other branches of science. The rapid advances of the past few years have been developed through a particularly close association of the chemist, the toxicologist and the entomologists. Future development will require an even closer cooperation among entomologists themselves and with chemist, toxicologists and other scientists. How to bring about a closer coordination between these branches of science is a problem of those concerned with administration. I am sure this problem of coordination will receive the serious attention it demands. The matter of cooperation is the concern of each of us. Let us then make an effort to measure up to the example of those who have gone before and the requirements of the future.

Different types of fire require different kinds of extinguishing materials.

Florida Citrus Exposition To Be Held Jan.15-22

Every citrus grower in Florida large or small, will be eligible t participate in the annual fresh frui contest, a feature of the 1955 Florid Citrus Exposition to be held Jan 15—22, Jack M. Berry, president o the industry show said recently.

"We want every citrus produce in the state who prides himself o the quality of his fruit to enter thi contest and to compete for the valu able cash prize and other awards," Berry said.

The only citrus show in the natio sponsored by the industry itself, th Exposition started its fresh fruit com petitions several years ago and eac year it has been necessary to expan space provided to show the com mercial packs of premium fruit.

Provisions will be made for award for the best boxes in all varieties o oranges, grapefruit, tangerines, tan gelos, limes and all other citrus fruits Prizes will be awarded for the bes box of each variety in each of the seven citrus commission districts, the winners in this grouping going into a statewide and sweepsteakes trial.

Prominent citrus merchandisers from the country's market centers wil act as judges for the fresh fruit com petition. Growers will be able to use any commercial container that is currently approved for commercial use on the Florida Citrus Commission's listing.

The somewhat earlier than usual dates of the 1955 citrus show, Jan. 15—22, will mean more of the early varieities of oranges and grapefruit available for the contest. Usually the show is held in mid-February, at a time when most of the earlier fruit has been harvested and the entries have been heavy to Valencia oranges and the late type grapefruit.

In an effort to give the Exposition even more of a citrus atmosphere the Winter Haven Chamber of Commerce, handling details of the feature parade on Monday, Jan. 17, is contacting industry firms, such as fresh fruit packers, canners, concentrators and byproducts manufactures, asking them to design and enter special floats in the long line of march. The Chamber of Commerce committe is aiming at a minimum of 25 special floats and a half-dozen or more bands.

The latest developments in citrus

juice dispensing machines, both coin-operated and manual types, will be shown at the 1955 Florida Citrus Exposition.

Space will be allocated for a large display of the devices which handle both freshly extracted juices as well as the reconstituted concentrates, Jack M. Berry, president of the Exposition, said today.

"In our effort to tell our visitors about the entire Florida citrus industry, we believe that demonstrations of the various methods of creating consumer demand and merchandising oranges, grapefruit and tangerines in both fresh and processed forms, are essential to give us a rounded-out picture to present to the public," Berry said.

Since the end of World War I, there have been many mechanical and scientific developments in juice dispensers which are credited with creating a "plus" business for millions of boxes of fruit and today juice dispensers of all types can be found side-by-side with soft drink and hot beverage vendors in thousands of "high traffic" locations over the country, Berry pointed out.

"In addition to giving the manufacturers a chance to show the citrus industry as well as visitors to the Exposition the various types of machines, they will at the same time provide a supply of the vitamin packed beverage for our patrons," he added.

The display of juice dispensers is but one part of the overall program to demonstrate all facets of the big Florida citrus industry, FCE officials say. A "junior" fresh fruit packing unit will be in operation during the show, along with a "pilot" processing setup, byproducts displays and other things pertaining to the billion dollar citrus industry.

LAKE CITRUS SLIGHTLY SMALLER AS RESULT OF INADEQUATE RAINFALL

Citrus in many Lake County groves is somewhat smaller than usual at this time of year as a result of inadequate soil moisture during the summer, according to County Agent R. E. Norris.

While numerous trees are well loaded on the outside, the amount of fruit on interior trees does not appear as large as in past years. Because of this, Mr. Norris says, a marked increase in production is not expected in Lake County in the 1954-55 season.

A Step Ahead Of The Oriental Fruit Fly

(U. S. Agricultural Research)

Fruit growers hate to think what could happen if the oriental fruit fly ever slips past border guards to establish itself in this country.

So far, the fly has been blocked from the United States by quarantines and inspections. But it constantly threatens invasion from the many areas in which it's established, particularly Hawaii. The fly is a hardy traveler, capable of moving great distances in cargoes of fruit.

This tiny, clear-winged insect attacks more than a hundred kinds of plants. It became a principal destroyer of many economic varieties of fruit grown in Hawaii—but fortunately not of the important pinapple—within 2 years after its discovery there in 1946.

Planning our defense in case the oriental fruit fly does invade depends largely on finding out just where we'll have to fight it—where the insect can best survive and build up infestations in this country.

Entomologists studying the fly's reaction to various simulated U. S. climates have thus far pinpointed these areas of the extreme South with winters potentially favorable to oriental fruit fly development or survival: southern Florida, the lower delta area in Louisiana, and along a coastal region and in the lower Rio Grande Valley in southern Texas. Most favorable winters are those where the average temperatures fall below 57 F. for only 2 months or less.

A marginal or "danger" zone where this fly might survive the winter includes a fringe along northern Florida, southern Texas, Louisiana, Mississippi, Alabama, and Georgia, the lower Colorado River and Imperial Valley areas in California, and part of southwest Arizona.

Exceptionally hot, dry, summer weather, with daily temperatures above 100 F., is hard on the oriental fruit fly. The simulated climates of Riverside, Fresno, and El Centro, Calif., Tempe, Ariz., and Weisacco, Tex., all had summer periods that were too hot for normal survival, reproduction, and development.

The melon fly and Mediterranean fruit fly, both serious pests of fruit in Hawaii, have also long threatened the U. S. mainland. These insects may find conditions in most of Florida and at some Gulf of Mexico coastal sites favorable for year-round development, but hot, dry weather affects them severely too. The melon fly was able to infest periodically during a simulated El Centro winter, and occasional adults were able to develop and emerge during a Fallbrook (Calif.) winter.

These climate studies, cooperative between USDA-ARS and the California experiment station, have tested the flies' reaction to the climates of 18 typical fruit-growing regions of the U. S. thus far.

Entomologists P. S. Messenger, N. E. Flitters, and associates plan further study of the effects of hot weather, as well as the availability of food for year-round development of fruit flies in these zones.

Government Studies Methods For Foreign Shipments . . .

Uncle Sam wants to find out the best way to package and ship fresh oranges and grapefruit to Europe so they will arrive in good eating condition, and federal money is being made available for the necessary investigation.

Robert W. Rutledge, general manager of Florida Citrus Mutual, recently announced he had been informed that a request by Mutual for a federal project along this line had been approved and trial shipments would start shortly.

Rutledge said he had been informed of the allocation of a substantial amount to this work by the U. S. Department of Agriculture, The information came from J. R. Winston, Orlando, senior horticulturist of the quality maintenance and improvement section, agricultural marketing service, U. S. D. A., who said there also is a good possibility an even larger amount will be made available for continuing these studies during the 1955-56 season.

Trial shipments will start around Nov. 15 and will be made every two weeks as opportunities present themselves. Tests will cover the entire range of containers and shipping conditions used in transporting fresh citrus overseas.

Mutual made its request some time ago for funds to finance such studies through the U. S. D. A. It asked that the studies be started soon enough so they could cover early ripening varieties, about which little is known.

Winston and an assistant will accompany the first test shipments, with the vessel carefully wired to record temperature and humidity conditions throughout the journey. The shipments will go to Antwerp and Amsterdam. In addition to the records made aboard ship, the tests will cover loading and discharging conditions and warehouse storage over a five-week period at destination.

Results of the research will be released as soon as possible as a guide to shippers in their export operations.

Mutual, in asking for this research stressed the increasing volume of Florida citrus being shipped overseas, with prospects that the amount exported during the 1954-55 season would exceed last season's all-time high.

Florida now ranks fifth in the nation in forest lands.

Fire Blight Stopped In 400-Acre Grove By Terramycin-Streptomycin Mixture

Fire blight, century-old plague of fruit trees, has been virtually wiped out in large scale commercial orchard tests employing a spray of the antibiotic drugs terramycin and streptomycin, a U. S. Department of Agriculture scientist announced at a meeting of agricultural scientists at Estes Park, Colo., recently.

The achievement was hailed as history-making by members of the American Phytopathological Society before whose convention the annoucement was made by John C. Dunegan, principal plant pathologist of the U. S. D. A. Annual losses due to fire blight are estimated at $70,000,000.

Dunegan said the antibiotics gave 98 per cent control of the disease. This was the first sucessful large-scale commerical orchard trial with antibiotic drugs which have saved millions of human lives. Four other leading plant scientists corroborated Dunegan's conclusions in papers delivered at the meeting.

In the past 100 years, fire blight, also called "pear blight," has destroyed pear growing east of the Mississippi and has made serious inroads in commercial apple producing areas.

For Dunegan's experiments, 600 bartlett pear trees were set aside in a 400-acre section of the DiGiorgio Orchards, Marysville, Calif. Half were sprayed with a mixture of the two antibiotics known as agri-mycin. The other half received a water spray. The inclusion of terramycin in the agri-mycin formula used by Dunegan was explained as a precaution against the possibility of the bacteria developing a resistance to streptomycin alone and rendering it ineffective.

Dunegan cited a typical example of the control obtained. In one untreated section of the test plot, 268 cases of infection were found. In the same test plot, among the same number of agri-mycin treated trees, there were only five infections.

Members of the phytopathological society said Dunegan's report may mark the end of the search for effective control measures, a search which began when the first Virginia colonist found his newly-planted pear and apple trees withered and scorched as if burned by fire. The disease has been spread across the country by bees, insects, wind and the rain.

The U. S. D. A. scientist also told the meeting that skin russeting of pears, caused by attempts to check fire blight with the traditional copper sprays, did not occur on fruit treated with the antibiotics. Russeted pears, unfit as fresh fruit, are sold at low prices to canneries.

Announcement of successful commercial orchard trials is expected to give impetus to research into the use of antiboitics against other bacterial diseases thus far considered incurable. These cause crop damage in the hundred of millions each year. Several diseases, bacterial spot of tomatoes and peppers, halo blight of beans, walnut blight, black leg and soft rot of potatoes, already have yielded to agri-mycin in field trials.

Use of terramycin and streptomycin for control of fire blight had been under investigation by federal, state and university research men for three years. Four of these scientists were present at the meeting here and dealt with the same subject. Their conclusions supported those of Dunegan. They are: H. F. Winter, H. C. Young, both of Ohio State Experiment Station; P. A. Ark of the University of California; and R. S. Kirby, Pennsylvania State College.

Winter and Young found streptomycin to be the most effective antibiotic for the treatment of apples and pears and Ark's work with pears paralleled that of Dunegan. Kirby used the agri-mycin formula for protection of apple trees in Pennsylvania.

Assisting Dunegan in the experimental work were: Jess R. Kienholz, pathologist, R. A. Wilson and W. T. Morris, all of the U. S. D. A. experiment station, Beltsville, Maryland.

FROZEN CONCENTRATES RETAIN VITAMIN C . . .

Florida frozen citrus concentrate stored for 12 to 15 months at temperatures as high as 40 degrees Fahrenheit retained an average of better than 95 per cent of their Vitamin C content, three research scientists at the Florida Citrus Experiment Station have reported.

Reconstituted juices prepared from the concentrates used in the study showed over 94 per cent retention of Vitamin C after two day's storage at 50 degrees Fahrenheit, which is representative of a reasonably high temperature in a household refrigerator, according to Richard L. Huggart, Dorothy Harman, and Dr. Edwin L. Moore.

Writing in a recent issue of the Journal of the American Dietetic Association, the three members of the Florida Citrus Commission's research department commented that "this would indicate that reconstituted citrus juices allowed to stand in a household refrigerator do not undergo appreciable losses of Vitamin C up to the time the juices ferment and otherwise become unpalatable."

Although the tests involved the storage of concentrates at temperatures up to 40 degrees Fahrenheit, the researchers pointed out that consumers should take care to see that citrus concentrates remain frozen at zero degree Fahrenheit or lower until the time of reconstitution.

"Although there was no appreciable decrease in the Vitamin C content," they warned, "enzymic action caused varying degrees of clarification and gelation in the concentrates stored at the higher temperatures."

The study also revealed that concentrates stored at minus eight degrees Fahrenheit for 12 months retained more than 98 per cent of its Vitamin C content.

EXTRACTION OF CITRUS JUICES

(Continued from page 8)

quite readily, to take care of variations in proportions of fruit in the two sizes.

This extractor was developed by a team of engineers, chemists, bacteriologists, and food technologists and to a large extent based upon requirements expressed by canning plant technologists. As a result careful consideration was given to requirements of sanitation. Except for the small peel plugs, the juice never comes in contact with the surface of the outer peel and except for the edge of the cutter tube, no surface of the machine is simultaneously exposed to air and juice. The manifold, which is joined to a closed juice tube is in itself a closed tube, thus reducing to a minimum air-borne contamination. Moreover, design features permit the manifold and strainer tube assembly to be quickly dropped for ready accessibility for through cleaning. As a result of these features micro-organism counts on the extracted juice are extremely low.

The most unique feature of this extractor, and which is considered by many to represent the greatest advance in the extraction of citrus juice, is the strainer tube which serves as a pre-finisher. By this means the seeds, core, and section membranes, are given a firm pressure and removes them immediately from the juice. This elimates the necessity of removing them by the standard type of finisher where they are severely rubbed or in the case of seeds, broken and crushed. This feature makes it possible to obtain maximum yield of juice without incorporating an excessive amount of pectinous mater or pectic enzymes which are responsible for gelation of frozen concentrate, and for separation and clarification of the reconstituted juice.

New Type of Cup

More recently a new type of cup assembly has been revised which makes it possible to recover the peel oil which is expressed during the extraction operation. This is designated as "oil-cup". This assembly has been designed in such manner as to permit comparatively ready substitution for the standard cup. The oil and aqueous matter expressed from the outer peel along with small particles of outer peel are separately collected from one side of the extractor. A small amount of water is added to this to provide fluidity. This mixture is run thru a finisher equipped with a fine screen and the peel oil is separated by means of a centrifuge. The resulting oil is a very high grade cold pressed oil and the yield is approximately three pounds per ton of oranges. This oil is ideally suited for re-incorporation into the final juice product to provide standardized full fresh bouquet.

It is now well recognized that a certain amount of this natural oil is necessary in the juice to provide flavor. Orange juice extracted on home type juicers, depending on the type, contains approximately 0.02 to 0.06% oil. In the case of commercial plants, studies over a period of years have shown that it is extremely difficult, if not impossible, to control the oil content of the juice by means of the equipment involved. It has been found that variations in fruit itself from lot to lot cause differences of as much as 100% in the oil content of the juice. This is accenuated even more in frozen concentrate. During evaporation most of the volatile oil is removed from the juice. Approximately 93% of orange oil consists of limeonene which is readily volatile and in fact is all that is measured in the distillation method of determining oil content of the juice. On the basis of the reconstituted 42 Brix frozen concentrate, the cut-back juice, which is blended with the 55 Brix juice delivered by the evaporators, represents only about 1/11 of the total, yet it contributes about 50% of the distillable or recoverable oil contained. Thus it is very difficult, if not impossible, to maintain close control of the oil content of the juice by means of adjustment of equipment. It seems obvious, therefore, that it is best to incorporate virtually no oil in the juice at the time of extraction and to add a fixed amount of top quality oil. Results of independent studies show that best results are obtained with the cold pressed oil rather than with the "folded" or concentrated oil.

Complex Chemical System

Research studies over a period of many years have revealed that citrus fruit is indeed a very complex chemical system. The core, section walls, the albedo (white portion of the peel), and the material surrounding the seeds contain a rather complex mixture of pectinous substances, proteins, flavonoids, and pectic enzymes. The seed including the hull, is likewise complex containing not only oil and protein substances, but probably other substances as yet not identified. The outer peel (flavedo) is possibly even more complex due to the various pigments, glucosides, and other substances which have not yet been identified. It is very strongly indicated that off-flavors and off-flavor development in juices which at one time were attributed to peel oil were actually due to non-oil substances which were put into the juice along with the peel oil in the process of extraction.

In view of these complex chemical substances contained in the various component parts of the fruit, and indications that they have an adverse effect on the quality of the juice product as initially produced or after some period of storage, obviously the inclusion of them in the juice should be minimized as much as possible.

The unique extractor described in this discussion was developed with these objects in mind. The elimination of opportunity of contact of the juice with the outer peel greatly minimizes inclusion of outer peel extractives. The strainer or pre-finishing tube, in itself a very new and unique principle, greatly reduces the amounts of undesirable pulp and seed substances in the juice, without sacrificing juice yield. Wide spread commercial operation over a period of a number of years since first usage has fully demonstrated the merits of this principle of extraction.

CLAYTON URGES FARM PEOPLE TO HELP GET USABLE CENSUS DATA

"The five-year agricultural census to be taken this fall is important to agriculture and rural life," says H. G. Clayton, director of the Florida Agricultural Extension Service. He says Extension workers will give full cooperation to the census and he urges farm people also to give accurate, usable information.

Waverly Growers Cooperative Celebrates 40th Year

Waverly Growers Cooperative, one of the oldest and most important of Florida citrus cooperatives has just celebrated its fortieth year of service to citrus growers of the Ridge section of the State's "Citrus Belt."

In honor of the event, the organization has issued a profusely illustrated historical brochure giving a resume of the early history of the organization and tracing step by step the growth from its organization in 1914 down to the present time where it ranks as one of the greatest of Florida's numerous cooperative citrus organizations.

Among the men who have been associated with Waverly Growers Cooperative were such noted figures as John D. Clark, C. H. Walker, Asa Gibbons and W. L. Pederson, all recognized leaders in the industry. Today it numbers among its active workers such able leaders as W. C. Pederson, president; H. S. Norman and James C. Morton and numbers among its 500 employees many who have served with the organization for more than a quarter of a century.

Waverly Growers Cooperative has always ranked as one of the greatest of the State's many citrus organizations and never has that position of leadership been greater than it is today.

CITRUS INSECT CONTROL FOR NOVEMBER, 1954

(Continued from page 3)

wettable sulfur. Lime-sulfur is not compatible with DN Dry Mix or aramite, but can be used with ovex.

Sulfur dusts can be used, but they are not so effective during cool weather and more thorough coverage is needed than during the warmer seasons. Always remember that longest control is obtained with thorough applications applied before mites build up.

For more detailed information, refer to the "Better Fruit Program" for 1954 or consult the Citrus Experiment Station at Lake Alfred, or Fort Pierce.

Two Florida county agents, E. D. McCall, Milton, and P. R. McMullen, St. Augustine, received distinguished service awards from the National Association of County Agricultural Agents at the recent annual meeting of the organization in Salt Lake City.

NOTES OF THE TRADE

WRIGHT HEADS FEED DIVISION ASHCRAFT-WILKINSON COMPANY

WRIGHT

The appointment of Albert C. Wright, Jr., Decatur, Illinois, as head of the Feed Division of Ashcraft - Wilkinson Company, distributors of feed ingredients, fertilizer materials and agricultural chemicals, has been announced by George W. McCarty, Chairman of the Board.

A native of Moweaqua, Illinois, Wright attended Millikin University at Decatur. As an employee of A. E. Staley Manufacturing Company since 1947, he has in recent years been Southeastern Sales Manager of their Feed Division.

CAUSES AND NATURE OF SPREADING DECLINE ON CITRUS

(Continued from page 7)

was no evidence of Spreading Decline.

3. Reproduction of Spreading Decline symptoms on test trees under controlled conditions was achieved with naturally infested subsoil and hand picked specimens of the burrowing nematode. Since the zone of greatest rootlet deterioration was found to be below 18 inches, naturally infested subsoil was collected from a depth of two feet from four distinct centers of Spreading Decline. A second series of samples was also collected from a depth of two feet in the healthy part of the same groves at least 200 feet ahead of the margin of the diseased area. These subsoil samples were collected early in the morning and carefully protected during trnsportation so that the temperature of the samples did not rise. The soil, upon arrival at the laboratory was immediately placed in five quart cans. One sour orange seedling six inches high was planted in each can. There were six replicates of plants in subsoil from the Decline area and six in subsoil from the healthy area of each of the four groves sampled. In all, there were 24 test plants growing in naturally infested subsoil and 24 check plants. The cans containing the soil and test plants were kept in a water bath at a constant temperature of 75 F. to 78 F. This temperature was selected because thermograph records taken at a depth of three feet in a typical Spreading Decline area showed that the temperature at that depth was between 69 F. and 79 F. for approximately one-half of the year, while a temperature of 80 F. was favorable for citrus root growth. Six weeks after the start of this experiment, it was evident that the seedlings growing in the "Decline" subsoils were not growing as well as the check plants in subsoil from the healthy parts of the groves. The experiment was continued for six months. At that time, all the plants growing in the "Decline" subsoil (from the four groves) were stunted and there was extensive deterioration of the rootlets. The same kind of brown lesion observed on the rootlets of naturally infested trees were also present on the rootlets of these test plants. Dissection of the rootlets revealed the burrowing nematode in the rootlets of the test plants but not in the rootlets of the check plants. This was true for all plants grown in infested soil. No other plant parasitic nematode was found in the rootlets or in the soil about the roots of any of the 48 plants in this experiment.

(Continued Next Issue)

CITRUS FRUIT INDUSTRY GROUP DISCUSSES SUPPLY AND DEMAND

U. S. Department of Agriculture officials met with a citrus fruit group at Washington, D. C., on October 12 and 13 at the request of representatives of the industry to discuss the supply - demand situation on citrus during the coming marketing season. This meeting between the Department and industry has become an annual one and is mutually beneficial in considering the marketing situation for the forthcoming season.

The discussion covered production trends and marketing problems, past govermental problems, the demand situation in the 1954-55 season, supply and utilization estimates, the industry's recommendations to the Department, and the detailed operations which would be necessary if the industry recommendations are adopted.

Recommendations made for the consideration of the Department include proposals that the export program in effect last season be continued in the new season and that purchases of citrus products for school lunch use be increased. Last year, the equivalent of about 4 million boxes of oranges and 1 million boxes of grapefruit were exported under the export program. Section 32 funds provided by Congress to facilitate exports of farm products in normal trade channels were used.

The Department now has the recommendations made by the group under consideration.

$3,600,000 ADVERTISING CAMPAIGN BOOSTS FLORIDA CITRUS FRUIT

Florida fresh oranges and grapefruit returned to the market this Fall, backed by a $3,600,000 consumer advertising program, largest in the 19-year history of the Florida Citrus Commission.

Announcing the arrival of the new crop in the nation's markets was a 900-line black and white advertisement in 270 daily newspapers east of the Rocky Mountains scheduled for insertion on Nov. 18, according to Paul S. Patterson, Commission advertising director.

Supporting the newspaper campaign will be four-color half-page ads in the Ladies Home Journal and Better Homes and Gardens on grapefruit and in the Saturday Evening Post and Look Magazine on oranges, Patterson continued.

The Commission's television and radio programs—"Twenty Questions" on 47 stations of the ABC-TV network Tuesday nights at 8:30, and Tom Moore's "Florida Calling" half-hour each week-day morning at 11 o'clock over 560 stations of the Mutual Broadcasting System—will also concentrate on the promotion of the fresh product.

In addition to the advertising assistance, the Commission will offer a display kit containing 16 pieces of material to be used at the point of sale.

Included in the kit will be two orange price cards, two grapefruit price cards, four orange pennants, two grapefruit pennants, two frieze strips, one poster for orange and one for grapefruit, and large 35-inch cutouts of fruit halves for oranges and grapefruit.

The Commission's field merchandising staff of 65 men, located from coast to coast in the U. S., and Canada, will assist retailers in erecting displays and arranging for demonstrations of Florida oranges and grapefruit.

Further information may be obtained from the Florida Citrus Commission, Lakeland, Florida, or from any member of the Commission's field staff.

ORIENTAL FRUIT MOTH, NEW INSECT ADVANCES

Reported By U. S. D. A.

Widespread damage to a variety of crops by the corn earworm, a serious outbreak of the oriental fruit moth in California, and discovery of several insects in new areas, highlight recent insect activity, entomologists of the U. S. Department of Agriculture reported recently.

Entomologists from Utah to Florida report damaging infestations of the corn earworm. Infestation is as high as 90 percent in corn in some areas of southern Utah. Kansas entomologists report that 40 to 60 percent of milo and sorghum heads are infested in northern areas of that state, and in central Missouri damage to heads of grain sorghum continues severe. In Florida, corn earworms have been found abundant in a peanut field near Trenton. They are damaging up to 25 percent of pods in some soybean fields in Hertford, Halifax, Bertie, and Northampton counties, North Carolina.

The outbreak of the oriental fruit moth in areas of Fresno, Kings and Tulare, counties, California, is resulting in the most serious damage by this pest in that state since its discovery there in 1942. In the infested areas, the late cling peach crop is nearly a total loss. Peach twig damage has been severe in both young and old trees in the Kingsburg vicinity, and some plum twigs show similar damage.

Idaho etomologists report their first collection of the lesser grain borer - - a stored grain insect - - in that state. A large population of the pest was discovered in a feed mill at New Plymouth. From Florida, a new scale insect (Aspidiotus taxodii) has been found for the first time infesting a bald cypress at Palmdale. The first specimen of the European corn borer has been collected in Boone county, Arkansas, and the southwestern corn borer has been found for the first time in Boone, Searcy, Van Buren, Faulkner, and Garland counties, Arkansas.

A complete rundowwn of the nation's current insect pest situation is available in the Cooperative Economic Insect Report, issued each Friday by USDA's Agricultural Research Service. The cooperative report is compiled from reports submitted to USDA by entomologists of the 48 States and U. S. possessions.

NATIONAL MAGAZINE FEATURES FLORIDA CITRUS FRUITS

Fresh Florida oranges, grapefruit, and limes are the featured items in a three-page full color article in the October issue of the magazine, Seventeen.

Entitled "Juicy Fruits," two pages of the layout pictures full boxes of oranges and grapefruit and a mixed box of limes and lemons. Also in beautiful full color are pictures of a grapefruit salad, a bowl of orange punch, and a appetite-tempting lemon-lime pie.

On the third page of the article are listed the recipes for the three citrus dishes pictured. Ingredients include lime juice and lime rind, frozen concentrated orange and grapefruit juices, canned grapefruit sections, and canned grapefruit juice.

The text accompanying the article points out that citrus fruits at one time were "rarities in northern climes. . . . .special treats to save for holidays." But today, the story continues, "one of the most usual and most cheerful sights all over the country is the fruit stall. . . . brimming over with golden yellow, bright orange, or glossy green citrus beauties."

"What's more, these good-tasting, good-tasting beauties are good for you, protecting you from colds and sniffles and other ailments. Eat or drink one or more every day. . . . in fresh, frozen, or canned form," the readers of Seventeen are told.

Arrangements for the article and pictures were made by Miss Beryl Walter, food editor of Seventeen, in cooperation with Miss Kate Titus, of Dudley, Anderson, and Yutzy, of New York, the agency handling a nation-wide food publicity program for the Florida Citrus Commission. Miss Walter was among a number of nationally known food editors who toured the Florida citrus belt as a guest of the Citrus Commission last February.

One of agricultural's biggest problems—weed control—will be up for discussion when the Southern Weed Conference meets at the Soreno Hotel in St. Petersburg, January 17-19, 1955. This is the 8th annual meeting of this conference. Weed control specialists and research workers from all over the South are expected to attend the conference.

See that all shields are in place before taking an implement to the grove or field.

Classified Ads

The LYONIZER

COMPILED BY THE LYONS FERTILIZER COMPANY

Reports Of Our Field Men . . .

SOUTH POLK, HIGHLANDS, HARDEE AND DeSOTO COUNTIES
C. R. Wingfield

With the passing of "Hurricane Hazel" both the citrus and Vegetable growers are breathing easier. With the heavy Citrus crops and the stage of vegetable crops it would have been disastrous to have either high storm winds or heavy rains. The change in weather will be advantageous to both crops.

The new crop estimate of citrus appears to be the topic of discussion, both pro and con. However there is more activity both by buyers and shipping. With cooler weather and more settled weather conditions we will have better fruit to offer. Grove activities are mostly spraying and getting the cover crop into the soil but the grower is taking time out to study his fertilizer needs and make plans to start the application early in November.

Vegetable crops are doing very well considering all they have had to go through and from all appearance markets will take them very nicely. Cucumbers at the time of writing are good and beans will move into the markets in a few days.

SOUTHWEST FLORIDA
Eaves Allison

Gladiolus growers have their first plantings well along with, growth about knee high now. Daily plantings are being made to insure continuity of flower cut.

That good Lyons fertilizer is keeping everything green and growing!

A few green Hamlins and early grapefruit are being picked now—Oct. 15th, from this area, but no great volume yet. Eating quality on the tree is fair for this fruit, but by the time it is worked, kneaded, cooked and shipped to market it might be a different story. How the price holds will be the answer.

So far we have not had any cool enough weather to hasten the ripening of citrus, but nevertheless some color break may be seen over most of this area. In most groves size and quality are excellent, and we have had sufficient moisture everywhere down here to date.

Vegetable crop acreage is at an all-time low for the fall planting season and there should be no surplus of production to depress prices.

NORTH HILLSBOROUGH AND PINELLAS COUNTIES
J. A. Hoffman

Fall is here again and the '54 and the '55 citrus harvest is getting in to full swing with Hamlin oranges and grapefruit already on the northern market. Most growers are satisfied with the returns and report a better than average yield on Hamlin oranges although a light grapefruit crop is reported in this area.

With a shortage of rainfall during the past rainy season there are signs of the need of rain in some sections especially groves located on high sandy ridges. Grove owners are busy cutting in their heavy cover crops and some have started their fall application of fertilizer and most all growers will have the fall application applied by the last of November.

A close watch for purple mite should be maintained during the fall months. Red scale is working in some sections and the necessary insecticides should be applied to control these pests so that the grower will be able to produce and hold a better quality of fruit.

For tops in quality and production for your soil whether it be grove, pasture land or vegetable—

HIGHLANDS AND POLK
J. K. Enzor, Jr. & R. E. Lassiter, Jr.

The latter part of September and the first two weeks in October found this section of the state with considerable rainfall, and grove condition at this time is very good. Up until these late rains started there were several sections that were very dry, and this moisture has caused a nice flush of September growth.

In many groves red scale has been a definite problem this fall and growers should be very thorough in checking their groves for this pest. Red scale infestations can build up at a very rapid rate.

Rust mite infestations are not particularly bad at this time but now is a good time for growers to check rust mites and at the same time to take note of their purple mite infestation.

The last of October will find the fall fertilizer application in full swing, and by the end of November most all groves in this area will have been fertilized.

EAST HILLSBOROUGH AND PASCO COUNTIES
E. A. McCartney

We have had fair rains up until about three weeks ago throughout this section but we need rain now. Trees are showing some wilt. Pumpkin bugs have been giving some trouble on early fruit. Since the cover crop has been chopped they seem to have gone into trees. This is a spotty condition. Fruit has sized up considerable since the last report but there is still going to be some small oranges. Some oranges have been moved—spot picked deal—no buyers around yet—lots of lookers though. Canning plants have not started yet so until they do there will not be much fruit moving.

Heard some discouraging news this A. M. about prices but will not quote it—hope it isn't so. Most groves have been chopped or disced and we are just in the beginning of our fall application of fertilizer. Indications are that growers will fertilize about as usual. So we will be busy from now on through November. Some scale and rust mite around but it seems to be pretty well under control.

NORTH CENTRAL FLORIDA
V. E. Bourland

Weather conditions have been hot and unsettled with rain in spots. Quite a bit of fruit has been picked, but has slowed down on account of drop in market, as a whole groves are not picking out according to what was estimated, and there are a lot of splits and drops in majority of groves. Oil spraying being done in groves that have scale, and other insects. I would suggest to growers to cut cover crops where it hasn't been done, and work up a good fire line around all groves, also to work and hoe young trees so that if necessary they can be banked quickly.

Citrus Production Is A Complicated Business

What with the task of combatting various pests, weather and diseases which from time to time attack our trees and crops . . . . but one thing is certain it is virtually impossible to produce fine fruit in sufficient quantities to make the job profitable without proper fertilization.

We maintain that fertilization is the most important single factor involved in the important job of producing adequate quantities of high grade fruit . . . . and we believe that successful citrus growers agree with us.

On the basis of the increased tonnage of our sales we have every reason to believe that a great number of Florida citrus growers agree with us, also that

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